

**WHAT IS CLAIMED IS:**

1. A composition comprising a bundle of individual carbon fibers, each of the carbon fibers forming a chain, and each chain having a surface area greater than  $13,000 \text{ m}^2/\text{g}$  and a hydrogen adsorption capacity of approximately at least about 20 percent by weight.

2. A process of producing a hydrogen storage composition comprising the steps of:

- providing a catalyst for the formation of carbon fibers;
- limiting the nucleation sites present on the surface of the catalyst;
- exposing the catalyst to a gaseous hydrocarbon;
- dissolving the carbon within the hydrocarbon into the catalyst;
- allowing the carbon to diffuse through the alloy and exiting upon a surface of the catalyst;
- forming a plurality of carbon chains on the surface of the catalyst;
- aggregating the carbon fibers into a bundle;
- removing the bundles from the catalyst.

3. A process of producing a linear atomic chain of carbon comprising the steps of:

- supplying a gas mixture comprising a hydrocarbon;
- exposing the gas to a catalyst, the catalyst disassociating the hydrocarbon to carbon atoms and hydrogen molecules;
- passing the disassociated carbon atoms from a first surface of the catalyst to a second surface of the catalyst along a temperature and pressure gradient;
- forming a plurality of single chain carbon filaments along the second surface of the catalyst;
- aggregating the single carbon filaments into a nanochain bundle, the bundle serving as a gas storage medium.